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EUG-6-1360

12 December 1956

Chief, Supplemental Programs Division

Chief, Engineering Division

Ferrite Antenna, Contract AD-1971, Task Order 3

1. The attached curves have been received from the [redacted]. They show the gain and impedance of the ferrite element alone and without loss due to impedance mismatch. This test was performed on the ferrite element which is being used in the wideband and narrowband antennas which have been delivered to us under this contract. These test results will be discussed in the next monthly letter report [redacted] 25X1

25X1

2. [redacted] Chief, SF/EA, has stated that because of the poor antenna gains indicated, [redacted] should devote full time to the study phase and should not perform any further test on these ferrite elements. This Division will forward these instructions to the [redacted] 25X1

25X1

25X1

[redacted] 25X1

Attachment as above

OC-E/R&D-EP/TGW:jac (12 December 1956)

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OPERATING INSTRUCTIONS FOR THE FERRITE ANTENNA-DETECTOR UNITS

I. NARROW-BAND UNITS

A. DESCRIPTION

The narrow-band antenna-detector unit is used to detect the presence of electromagnetic radiation, to determine the carrier frequency, and to provide information about the modulation frequencies in the form of an audio frequency output. The device was designed to operate into a high gain audio amplifier having an input impedance of 1000 ohms. It consists of a ferrite loop antenna in series with a narrow band, tunable filter, and a crystal detector. A schematic diagram of the cicruit is shown in Figure 1.

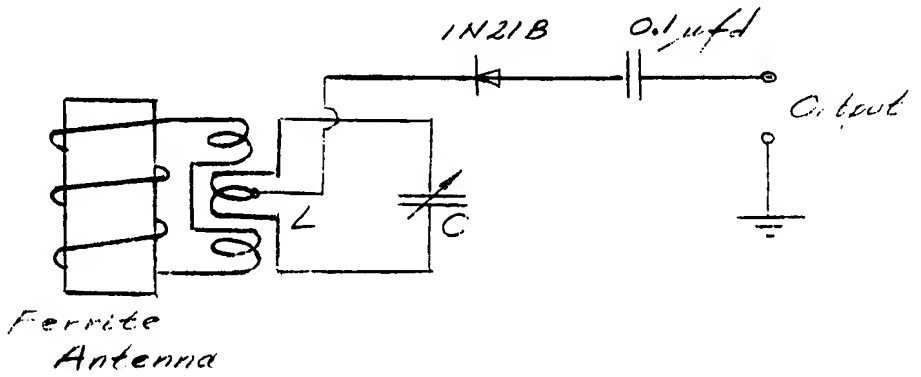

FIGURE 1

SCHEMATIC DIAGRAM OF NARROW-BAND UNIT

The electromagnetic fields induce voltages in the ferrite antenna across a broadband of frequencies. The antenna is coupled to the bandpass filter. The variable capacitor "C" allows the filter to be tuned over a band of frequencies from

approximately 30 to 230 mc/s. The non-linear resistance of the diode demodulates the carrier and provides an audio-frequency output.

The circuit is packaged in a small, sturdy container to allow convenient carrying. The assembled unit is sketched in Figure 2. The capacitor is actuated by

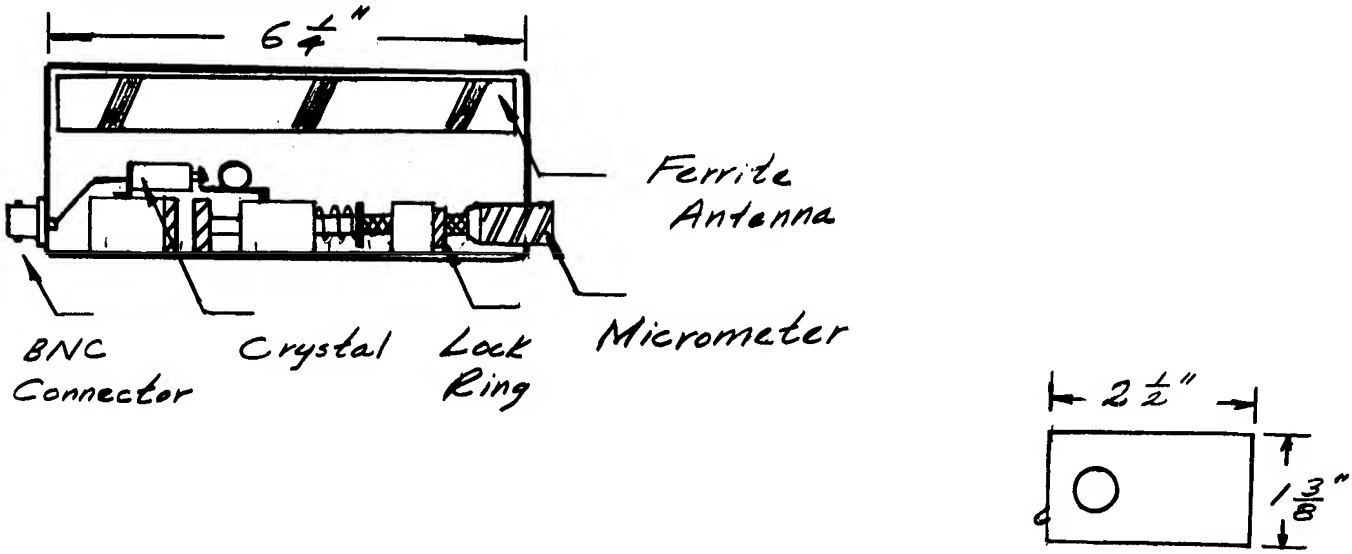

FIGURE 2

NARROW-BAND UNIT

a micrometer. The micrometer is calibrated for accurate frequency measurements and is provided with a lock to preserve any desired frequency setting. The output terminal of the unit is a BNC connector.

B. OPERATION

1. Connect the output of the antenna unit to the input of an audio amplifier having a 1000 ohm input impedance.

2. Orientate the ferrite rod so that its length is parallel to the magnetic field intensity vector; i.e., place the rod vertically for horizontally-polarized radiation.

3. Unlock the micrometer shaft and turn the micrometer until a maximum signal is delivered from the audio amplifier.

4. Lock the micrometer and read the micrometer scale.

5. Determine the R-F frequency corresponding to the micrometer scale reading from the calibration chart.

6. Determine the modulation frequency content from the audio amplifier output.

C. MAINTENANCE

Little maintenance on the ferrite antenna-detector unit is anticipated. However, the ferrite material is rather brittle and should be handled with reasonable care.

The crystal can be permanently damaged by subjecting it to very intense electromagnetic fields or strong mechanical shock. If the crystal is damaged, it can readily be replaced. The circuit is accessible by removing the six 0-80 screws from the top of the plastic box. The crystal is held in the circuit by two friction clips. Care must be taken not to damage the coils when replacing the crystal. After the crystal is installed, make certain none of the coil windings are shorted.

A 1/2 mil "Mylar" sheet is used to insulate the two capacitor plates. The "Mylar" is bonded to one capacitor plate with "Pliobond". The "Pliobond" is thinned with methyl-ethyl-keytone, applied to the one plate, and allowed to dry. Then the "Mylar" is attached to that plate under pressure.

The zero reading of the micrometer can be adjusted within small limits to correspond to a particular frequency setting. Set the micrometer at the desired frequency and then lock it. Hold the micrometer by the movable section and loosen the screw at the top of the micrometer shaft. Rotate the shaft until it reads zero and then tighten the screw without permitting the shaft to rotate off zero.

Whenever the crystal is replaced, the micrometer zeroed, or the unit subjected to mechanical shock, it will be necessary to re-calibrate the unit. To calibrate, the unit is excited by a test loop. The test loop is driven by a frequency calibrated R-F signal generator which is modulated at an audio frequency. The antenna unit is connected to an audio amplifier and then tuned for maximum output. The carrier frequency is plotted versus the micrometer dial reading which produces the maximum output. The test loop is 1 inch in diameter and is situated 6 inches from the antenna unit and orientated for maximum coupling to the ferrite antenna. See Figure 3.

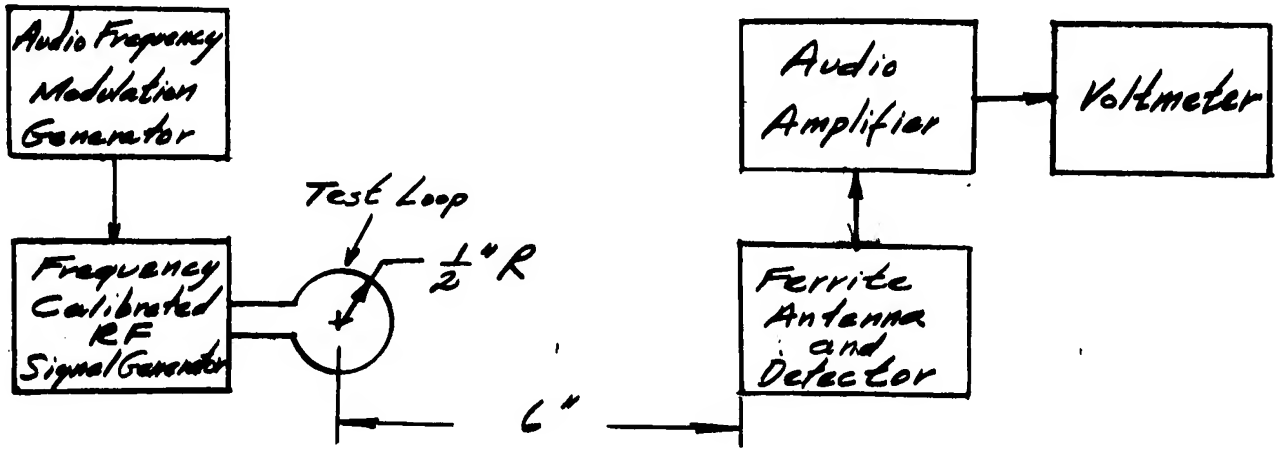

FIGURE 3

CALIBRATION SET-UP

II. WIDE-BAND UNITS

A. DESCRIPTION

The wide-band antenna-detector unit is used to detect the presence of audio-frequency modulated electromagnetic radiation in the meter wavelength range. The device was designed to operate into a high-gain audio amplifier having an input impedance of 1000 ohms. The unit consists of a ferrite loop antenna in series with a crystal detection. See Figure 4.

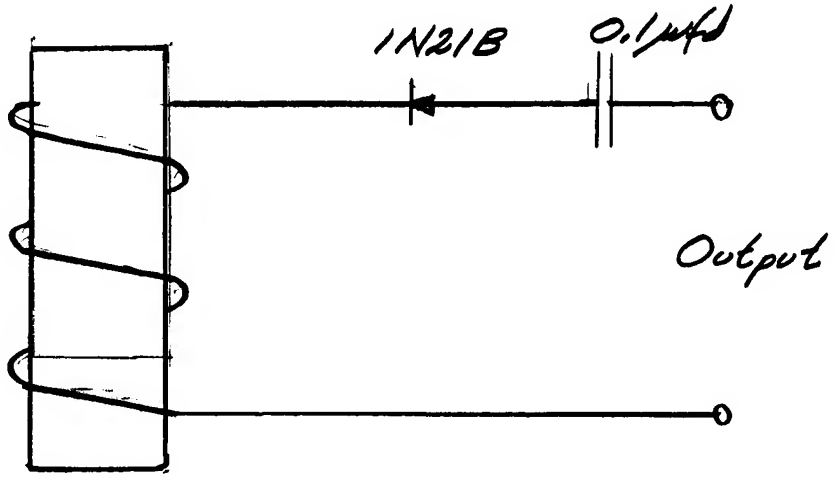

FIGURE 4

The circuit is packaged in a small, sturdy container to allow convenient carrying. The assembled unit is sketched in Figure 5.

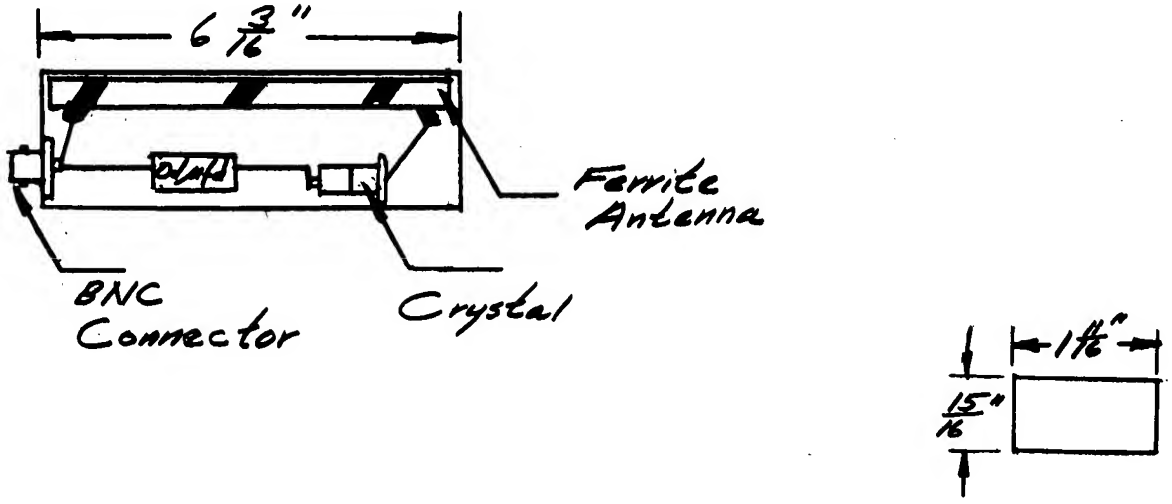

FIGURE 5

B. OPERATION

1. Connect the output of the antenna unit to the input of an audio amplifier having a 1000 ohm input impedance.

2. Orientate the ferrite rod so that its length is parallel to the magnetic field intensity vector; i.e., place the rod vertically for horizontally-polarized radiation.

An output from the audio amplifier indicates the presence of electromagnetic radiation and reveals the modulation frequency content. The audio amplifier output will, in general, be the composite of many signals received by the antenna. It will usually be necessary to locate the antenna close to the transmitter whose operating frequencies are of interest so that the signal from that transmitter is the strongest signal received. A weak signal can only be identified in the absence of all other signals.

C. MAINTENANCE

The circuit is accessible by removing the eight 0-80 screws from the top of the plastic box. The crystal is held in the circuit by two friction clips and can be replaced easily. Since the ferrite is brittle and subject to breakage, reasonable care should be taken in handling the unit.